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Fancy gadgetry invades the trades, from earth-moving to construction to plumbing

by Barbara Marquand

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Nothing could be more down-to-earth than the job of moving dirt — or so it would seem.

But today even bulldozers and graders are going high-tech — sky-high, in fact. More and more of the earth-moving machines are equipped with global positioning system receivers, which, using signals from satellites, control where and how deep they dig.

It's just one example of gee-whiz technology that can be found in the trades. Plumbers, carpenters, heavy-equipment operators, construction foremen — you name it — they're all using cool tools to do their jobs better and faster.

Teichert Construction has been using bulldozers and graders equipped with GPS controls the last two to three years, President Doug Urbick says. The company is one of the leading local outfits in site development, which involves clearing and grading land and installing utilities before construction begins. Before the new technology came along, the bulldozer or grader operator eyed survey stakes and got assistance from someone on the ground to determine how to set the equipment. Now all the engineering plans are fed into the GPS receiver, which then automatically controls the height and angle of the blades. Using the technology, crews are able to work faster without sacrificing precision.

The cost has dropped. The price tag on a commercial GPS system ranges from $200 for a handheld unit to more than $5,000 for the most sophisticated models.

Entering the fourth dimension: Computer-aided design, in which three-dimensional drawings are rendered by computer, was the next big thing in construction a decade ago. Now a fourth dimension has been added: time.

A growing number of builders, such as DPR Construction in Sacramento, are using customized software that allows them to produce 4-D drawings, which take into account all the design specs as well as the proposed construction schedule.

This provides several advantages. When the project is still on the drawing board, teams can catch any logistical errors in their scheduling. Say, for instance, a huge piece of equipment must be installed inside a building during construction. The 4-D program would help the scheduler make sure the equipment is installed in time — when there is still easy access. If scheduled too late — after the walls are up — the openings would be too small for the equipment to get through, an error that would prove costly.

The 4-D program helps everyone involved with a project, says DPR's Sacramento regional manager Brad Des Jardin. Clients are able to visualize how the project will progress, allowing them to make better-informed decisions without holding anything up. And subcontractors are able to see what their working conditions will be like before they even bid the project.

Des Jardin says sometimes it's hard to describe the access to a certain part of the building where subcontractors will work. But with the program, the subs can see it virtually beforehand. That allows them to bid accordingly and prepare better for the job. "It avoids changes in the field because of unforeseen conditions," he says.

Electronic communication has taken hold out in the field as much as in the office. Construction superintendents carry laptops, and carpenters use Palm Pilot handheld computers. This year, DPR's construction foremen will start using Palms for filing daily safety reports. They used to write those on paper, and the reports then had to be transcribed. Now they'll write them by hand onto Palm Pilot screens and send them directly to the company's computer system, which will save time back at the office and help the company to categorize and keep better track of safety challenges.

New kinds of plumber's friends: Tool kits of other trades have expanded too. Take the plumber — now as likely to tote sophisticated camera and sound equipment as wrenches and plungers. Electronic equipment has been helping plumbers detect leaks and find clogs for more than a decade, but it's gotten more sensitive as technology has improved, and a growing number of contractors are using it.

Bob Routon, owner of the Sacramento franchise of American Leak Detection, says the sound equipment plumbers use today to find leaks is based on technology developed by the U.S. military and used for listening for the enemy in the Vietnam War. The equipment comes in a small box with a handle and with microphones and headphones attached. The plumber places the microphone in various places, and listens through the headphones to determine the location of the leak.

It's not as easy at it sounds because the microphone picks up all kinds of noises. "You can hear a baby crying next door," Routon says. The plumber has to be able to recognize the telltale noise that a leaking pipe makes and tune out all the garbage.

"You almost have to go into a mind set like you're meditating," Routon says.

Developing the skill takes training and experience. American Leak Detection offers a six-week classroom training course, and contractors then train apprentices in the field.

Routon says he can usually determine a leak within three inches of its location. The toughest jobs are the ones outdoors on dirt, which absorbs sound. Plumbers then have to tote around a sound board and place it on top of the earth to help the microphones pick up the sound better.

The most interesting job Routon ever got to do was finding a leak under the whale tank at Six Flags Marine World in Vallejo, but not so much because of the nifty plumbing technology. "I got to pet an orca," he says.

The toughest job ever was finding a leak in a water main. The only clue? It was somewhere along a two-mile stretch. Construction crews had already tried in vain for weeks to locate the leak and had dug holes all over the place. Using their sound equipment, Routon and a partner painstakingly walked the entire stretch, listening through microphones. Finally after three days, they found it. "We saved them a lot of money," he says.

Camera equipment is another high-tech plumber's helper. Plumbers use specialized video cameras to find breaks and roots in sewer pipes. The camera is attached to the end of a line, which is inserted into the sewer pipe. It makes a video recording of the journey — in color if so desired — and the plumber and property owner can watch on a screen.

"The proof is in the picture," says Mark Bonney, owner with wife, Candace, of Bonney Plumbing and Rooter Service in Sacramento. The equipment shows exactly what the problem is, which can be helpful for insurance purposes, and it sends out a signal so plumbers can determine exactly where the problem is in the pipe.

Another new development in sewer lines is a trenchless sewer replacement system. This system allows a team to replace a sewer line without having to dig a big trench through a yard. A hole is dug where the sewer line exits a house. Then a hydraulic system pulls the new sewer line through. As the new line is pulled, the old pipe is decimated.

Though sophisticated plumbing technology has been around for a while, many customers are unaware of it and are surprised when their techie plumbers arrive. That old plumber stereotype of a common working stiff is clearly outdated. "Plumbers have come a long way," Bonney says.

Municipalities link to satellites too: Jacksonville, Fla.'s government spent $250,000 to adopt GPS in the late 1990s to map infrastructure.

It surveyed and mapped Cecil Field, an airport 15 miles west of downtown, with GPS, says Glenn McGregor, manager of the topographical survey section of Jacksonville's Public Works Department.

"If we had to hire three or four survey companies it would have taken an ungodly amount of time," he says. "It only took us 18 months. It would have taken three to 41/2 years conventionally. It probably saved us $1 million-plus."

In other aspects of mapping city infrastructure, GPS has saved "at least hundreds of thousands of dollars," he says.

"Our major use for it as a city is to generate coordinates that can be used as a control by others," McGregor says. "Ultimately, it can lead to more efficient construction by preventing mistakes and reducing surveying costs."

Several years ago, the city was building a jail downtown and workers almost dug their way into a major power line. An official with the local utility, JEA, saw what they were doing and prevented an accident.

"Someone would have gotten killed or hurt seriously," he said.